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	Document ID	Title
1	JP 2001232682 A	METHOD FOR MANUFACT
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4	EP 1310356 A	Manufacture of biaxially orien

PAT-NO: JP02001232682A

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TITLE: METHOD FOR MANUFACTURING THREE-LAYERED CO-E
BIAXIALLY STRETCHED POLYPROPYLENE PEARL GLOSS SY
PAPER FOR IN-MOLD BONDING LABEL AND TRANSPARENT I

PUBN-DATE: August 28, 2001

INVENTOR-INFORMATION:

NAME	COUNTRY
RIN, HOKIN	N/A

INT-CL (IPC): B29C055/14, C08K003/22 , C08K003/26 , C08K005/00 , C08L023/

ABSTRACT:

PROBLEM TO BE SOLVED: To provide a method for manufacturing pearl gloss synthetic paper and a transparent film suitable as an in-mold bonding label capable of being integrated with a molding material of a bottle or a can even if a hot melt adhesive is not preliminarily applied to the rear surface of each of the synthetic paper and the transparent film.

SOLUTION: A single screw extruder and a vent type twin-screw extruder having a side feeder are used by a three-layered coextrusion method and a composition of a polypropylene resin and inorganic matter is respectively extruded from both extruders and the extrudates from both extruders are allowed to meet with each other to form a three-layered sheet of paper-like layer or resin layer/foamed intermediate layer or resin layer/resin layer and this three-layered sheet is further passed through cooling/ molding, biaxially stretching, corona treatment and taking-up steps to obtain the pearl gloss synthetic paper for the in-mold bonding label of the three-layered coextrusion type of matte surface paper-like layer/foamed intermediate layer/adhesive layer

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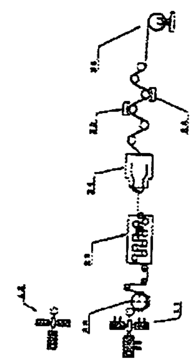
最終頁に続く

(54)【発明の名称】 型内貼りラベル用の三層共押出二軸延伸ポリプロピレンパール光沢合成紙及び透明膜の製造方法

(57)【要約】

【目的】予め裏面にホットメルト接着剤塗工を行なわなくともボトル，缶等の成形材料と一体化できる型内貼りラベル用として好適なパール光沢合成紙及び透明膜の製造方法を提供する。

【構成】三層共押出方法により、シングル・スクリュー押出機及びサイドフィーダーを持つベント式トゥイン・スクリューの押出機を用い、ポリプロピレン樹脂と無機物との組成物を主、副押出機からそれぞれ押出して合流させ、1つのTダイヘッドを経て、紙状層、または樹脂層／発泡中間層または樹脂層／樹脂層の三層シートとし、更に冷却成形、二軸延伸、コロナ処理、巻取りのステップを経て、マット面紙状層／発泡中間層／接着層、光沢紙状面／発泡中間層／接着層の三層共押出式型内貼りラベル用のパール光沢合成紙及び樹脂層／樹脂層／接着層の三層共押出式型内貼りラベル用の透明膜とする。



PAT-NO: JP02001232682A

DOCUMENT-IDENTIFIER: JP 2001232682 A

TITLE: METHOD FOR MANUFACTURING THREE-LAYERED CO-EXTRUDED BIAXIALLY **STRETCHED POLYPROPYLENE** PEARL GLOSS **SYNTHETIC** **PAPER** FOR IN-MOLD BONDING LABEL AND TRANSPARENT FILM

PUBN-DATE: August 28, 2001

INVENTOR-INFORMATION:

NAME	COUNTRY
RIN, HOKIN	N/A

INT-CL (IPC): B29C055/14, C08K003/22 , C08K003/26 , C08K005/00 , C08L023/12

ABSTRACT:

PROBLEM TO BE SOLVED: To provide a method for manufacturing pearl gloss **synthetic paper** and a transparent film suitable as an in-mold bonding label capable of being integrated with a molding material of a bottle or a can even if a hot melt adhesive is not preliminarily applied to the rear surface of each of the **synthetic paper** and the transparent film.

SOLUTION: A single screw extruder and a vent type twin-screw extruder having a side feeder are used by a three-layered coextrusion method and a composition of a polypropylene resin and inorganic matter is respectively extruded from both extruders and the extrudates from both extruders are allowed to meet with each other to form a three-layered sheet of paper-like layer or resin layer/**foamed** intermediate layer or resin layer/resin layer and this three-layered sheet is further passed through cooling/ molding, biaxially stretching, corona treatment and taking-up steps to obtain the pearl gloss **synthetic paper** for the in-mold bonding label of the three-layered coextrusion type of matte surface paper-like layer/**foamed** intermediate layer/adhesive layer or gloss paper-like surface/**foamed** intermediate layer/adhesive layer and the transparent film for the in-mold bonding label of the three-layered coextrusion

type of resin layer/resin layer/adhesive layer.

---------- KWIC ---------

Abstract Text - FPAR (1):
PROBLEM TO BE SOLVED: To provide a method for manufacturing pearl gloss **synthetic paper** and a transparent film suitable as an in-mold bonding label capable of being integrated with a molding material of a bottle or a can even if a hot melt adhesive is not preliminarily applied to the rear surface of each of the **synthetic paper** and the transparent film.

Abstract Text - FPAR (2):
SOLUTION: A single screw extruder and a vent type twin-screw extruder having a side feeder are used by a three-layered coextrusion method and a composition of a polypropylene resin and inorganic matter is respectively extruded from both extruders and the extrudates from both extruders are allowed to meet with each other to form a three-layered sheet of paper-like layer or resin layer/**foamed** intermediate layer or resin layer/resin layer and this three-layered sheet is further passed through cooling/ molding, biaxially stretching, corona treatment and taking-up steps to obtain the pearl gloss **synthetic paper** for the in-mold bonding label of the three-layered coextrusion type of matte surface paper-like layer/**foamed** intermediate layer/adhesive layer or gloss paper-like surface/**foamed** intermediate layer/adhesive layer and the transparent film for the in-mold bonding label of the three-layered coextrusion type of resin layer/resin layer/adhesive layer.

Title of Patent Publication - TTL (1):
METHOD FOR MANUFACTURING THREE-LAYERED CO-EXTRUDED BIAXIALLY **STRETCHED** **POLYPROPYLENE** PEARL GLOSS **SYNTHETIC PAPER** FOR IN-MOLD BONDING LABEL AND TRANSPARENT FILM

US-PAT-NO: 5180626

DOCUMENT-IDENTIFIER: US 5180626 A

TITLE: Opaque and pearlescent, laminated and stretched products, and method for making them

---------- KWIC ---------

Brief Summary Text - BSTX (8):

(2) providing a large number of **foams** in products by adding **foaming** agents to polypropylene during molding,

Brief Summary Text - BSTX (11):

These techniques, however, have the following drawbacks. That is, problems with the first technique are that it is difficult to obtain pearlescence with white pigments and extender pigments, and pearl essence is very costly and moreover has to be added to polypropylene in a large quantity. With the second technique, it is difficult to provide uniform and fine **foams** in thin products such as films, because the **foams** have a tend to become large in size. A problem with the third technique is that, since the inorganic fillers are added to polypropylene in large quantities, there is a great deal of drop of fluidity during extrusion or occurence of clogging of a screen pack. Another problem is that the inorganic fillers tend to absorb moisture, causing poor dispersion of the inorganic filler and generation of **foams** in the products, and the replacement of resins in the molding-machine takes much time. Yet another problem is that the product becomes ill-lustered and roughened on its surface. A problem with the fourth technique is that a treating step needs to be provided separately after a forming step and further needed are a step of removing the solvents and chemicals, suffering from a disadvantage in terms of the equipment and expense. Another problem is that the product thus produced has a dull touch and is ill-lustered.

Detailed Description Text - DETX (22):

The thickness of each of the obtained films was measured. As a result, it was found that even when the laminated materials have a same thickness before stretching, the thickness of the biaxially stretched films is inversely

proportional to their density--the lower the density, the larger the thickness; for instance, the films of Comparative Example 2 and Example 3 are 33 .mu.m and 45 .mu.m in thickness respectively. In other words, the obtained films vary in thickness (apparent thickness) due to fine **foams** being produced therein by stretching.

CLAIMS

[Claim(s)]

[Claim 1] In the manufacture method of the thickness biaxial-stretching polypropylene (BOPP) pearl gloss synthetic paper of 25-250 microns obtained by the three-layer co-extrusion method 39 - 95 % of the weight (MFI:0.5-8) of high crystallinity polypropylene, 0 - 40 % of the weight of calcium-carbonate powder of 97% or more of isotactic degree, 0 - 20 % of the weight of titanium dioxides, and the polypropylene resin mixture which consists of 1 - 5 % of the weight of static electricity inhibitors, 22 - 99.5 % of the weight of polypropylene, 0 - 12 % of the weight of polyethylene resins, 0 - 20 % of the weight of titanium-dioxide powder, 0 - 40 % of the weight of these calcium-carbonate powder, The resin mixture which consists of 0 - 3 % of the weight of these static electricity inhibitors, 0.5 - 3 % of the weight of antitack agents, and 0 - 2 % of the weight of ultraviolet ray absorbents It puts in, respectively from the hopper of one twin screw main extruder which has a side feeder, respectively, and two twin screw secondary extruders with this side feeder, and a feeder. Set the temperature of an extruder as 180-280 degrees C, and it extrudes from T die head after unification. Consider as a pearl gloss synthetic paper sheet, and cool and it fabricates by the 15-60-degree C cooling roller. The extension after heating the paper sheet which carries out biaxial stretching after that at 150-150 degrees C, Carry out annealing, perform extension to lengthwise three to 6 times, and it heats at further 140-195 degrees C. Extend, carry out this annealing, perform extension in a longitudinal direction five to 12 times, and, next, the RF corona treatment of 20-120kW efficiency is performed. It rolls round with take-up motion. A paper-like layer / foaming interlayer / this paper-like layer with a thickness of 25-250 microns, It considers as three kinds of three-layer co-extrusion polypropylene pearl gloss synthetic papers of this foaming interlayer / resin a paper-like layer / this layer, and a resin this resin layer / this layer. [a foaming interlayer /

this layer] The manufacture method of the thickness biaxial-stretching polypropylene pearl gloss synthetic paper of 25-250 microns obtained by the three-layer co-extrusion method characterized by considering as the application paper of the synthetic paper for an application.

[Translation done.]

DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[The technical field to which invention belongs] this invention is a thing about the manufacture method of the thickness biaxial-stretching polypropylene pearl gloss synthetic paper of 25-250 microns obtained by the three-layer co-extrusion method. The mixed extrusion object of polypropylene resin and an inorganic substance extruded from two twin screw secondary extruders which have especially one twin screw main extruder which has a feeder, respectively, and a feeder by the three-layer co-extrusion method is made to join. It considers as the three-layer sheet of a paper-like layer, a resin layer / foaming interlayer / paper-like layer, or a resin layer through one T die head. Furthermore pass steps, such as cooling fabrication, biaxial stretching, a corona treatment, and winding. The three-layer co-extrusion double-sided paper-like side pearl gloss synthetic paper of a paper-like layer / foaming interlayer / paper-like layer with the thickness of 25-250 microns, The three-layer co-extrusion pedion paper-like side pearl gloss synthetic paper of a paper-like layer / foaming interlayer / resin layer and the three-layer co-extrusion double-sided glossy-surface pearl gloss synthetic paper of a resin layer / foaming interlayer / resin layer are manufactured, and what is used as the application paper of the synthetic paper for an application is pointed out.

[0002]

[Description of the Prior Art] The present polyolefine synthetic paper tends to replace natural pulp paper-milling paper. The synthetic paper which uses the biaxially oriented film of polypropylene as a base-material layer (interlayer), and uses as a paper-like layer the polypropylene 1 shaft oriented film which includes the non-subtlety fine powder end of 8 - 65 % of the weight in both sides is applied for and put

in practical use. Oji-Yuka Synthetic Paper, Inc. has submitted patent application, such as JP,46-40794,B, JP,56-141339,A, JP,56-118437,A, and JP,3-87255,A.
[0004]
[Problem(s) to be Solved by the Invention] From these manufacture methods, the base-material layer was placed between lengthwise extension equipment and longitudinal direction extension equipment, two sets of extruders were used, the vertical film was made, and the paper-like layer is completed by them. Being able to extend a paper-like layer only in a longitudinal direction, the intensity of a paper-like layer is a low. Since it drops out in a printing processing process the end of non-subtlety fine powder it is added in order to raise the printing nature of a paper-like layer, it is necessary to clean a printing machine machine. Moreover, the total rates of extension differ, for this reason, at the time of heating, the contractions of a paper-like layer and a base-material layer will also differ, and paper will deform the paper-like layer obtained by uniaxial stretching, and the base-material layer obtained by biaxial stretching in the shape of a wave. In order to raise the stability of a manufacturing process and product quality furthermore, in the manufacturing process of the paper-like layer which completes a vertical film by two sets of extruders, a production rate is restricted and the width of face of the finished product after extension is only a maximum of 6 meters. As for the thickness of eye an at least 10-micron (usually 30 microns) required hatchet and a product, the thickness of a single paper-like layer always becomes 60 microns or more. Otherwise, the thickness of a product will become uneven and printing processing will be affected. The degree of difficulty of a manufacturing process is high on the whole, since a production cost is also high, a product cannot spread easily and application is difficult.
[0005]
[Means for Solving the Problem] In order to solve the above-mentioned problem, this invention applicant submits the manufacture method of a new 3 layer-structure synthetic paper. The synthetic paper concerned consists of a paper-like layer, a resin layer / foaming interlayer / paper-like layer, or a resin layer. From a twin screw main extruder with one set of a feeder, a foaming interlayer's polypropylene resin mixture The resin mixture of a paper-like layer or a resin layer is extruded from a twin screw secondary extruder with two sets of feeders, respectively. These extrusion objects are made to join, it considers as a three-layer sheet through one T die head, and the pearl gloss synthetic paper of three-layer ******** / double-sided paper-like side with the thickness of 25-250 microns, and a double-sided glossy surface is further obtained through steps, such as cooling fabrication, biaxial stretching, a corona

treatment, and winding. The manufacture method of this invention adopts a three-layer co-extrusion method. After making the extrusion object of each class join, with the synthetic paper which stuck the paper-like side which carried out uniaxial stretching to the interlayer who did biaxial stretching by the co-extrusion and the method of the former [synthetic paper / which was obtained by carrying out a 2 axial-stress total] further, and was obtained, it differs also from structure and the manufacture method. By choosing out of the paper-like layer which used the inorganic bulking agent for the raw material simultaneously extruded from a subextruder, and the resin layer which has not added the inorganic bulking agent, the three-layer co-extrusion double-sided paper-like side pearl gloss synthetic paper of a paper-like layer / foaming interlayer / paper-like layer, the three-layer co-extrusion pedion paper-like side pearl gloss synthetic paper of a paper-like layer / foaming interlayer / resin layer, and the three-layer co-extrusion double-sided glossy-surface pearl gloss synthetic paper of a resin layer / foaming interlayer / resin layer can be manufactured, and it can consider as the

[0006]

[Embodiments of the Invention] In order to show the technical contents of this invention clearly, polypropylene resin mixture and a manufacturing process (extruding three-layer co-extrusion, cooling, biaxial stretching, a corona treatment, winding) are explained below. The biaxial-stretching polypropylene pearl gloss synthetic paper of this invention has three layer structures. The foaming interlayer extrudes with a twin screw main extruder with one set of a side feeder. 39 - 95 % of the weight of high crystallinity polypropylene of 97% or more of isotactic degree and 1 - 5 % of the weight of static electricity inhibitors are uniformly stirred with the hopper which is ahead of the main extruder, and it puts into the main extruder. Furthermore, it puts into the main extruder by one set or two sets of side feeders after measuring 0 - 40 % of the weight of calcium-carbonate powder, and 0 - 20 % of the weight of titanium-dioxide powder. After kneading uniformly with the twin screw of the main extruder, the mixture of a resin and inorganic powder is pushed on middle RANA (runner) of T die head. Moreover, a paper-like layer is extruded with two twin screw main extruders with a side feeder. After stirring uniformly 20 - 99.5 % of the weight of polypropylene, 0 - 12 % of the weight of polyethylene, 0 - 3 % of the weight of static electricity inhibitors, 0.5 - 3 % of the weight of antitack agents, and 0 - 2 % of the weight of ultraviolet ray absorbents with the hopper which is ahead [subextruder], it puts into a subextruder. Furthermore, it puts into a subextruder by one set or two sets of side feeders after measuring 0 - 40 % of the weight of calcium-

carbonate powder, and 0 - 20 % of the weight of titanium-dioxide powder. After kneading uniformly with the twin screw of a subextruder, the mixture of a resin and inorganic powder is pushed on the both-sides path of T die head. The extrusion object from three above-mentioned extruders is made to join, and the sheet of a co-extrusion, a resin layer, a paper-like layer / foaming interlayer / resin layer, or a paper-like layer is formed by T die head. The pearl gloss synthetic paper of ** / pedion paper-like side with a thickness of 20-250 microns is manufactured through biaxial stretching, a corona treatment, and the step of winding. The synthetic paper manufactured by the manufacture method of this invention fits cultural paper, and is using high crystallinity polypropylene as main raw materials. Melting indices (MFI) are 0.5-8 (230 degrees C / 2.16kg ASTM D1238), and use as a homogeneous-polymerization object with isotactic most the polypropylene resin used by this invention. this kind of macromolecule structure -- molecules -- an array -- it has joined together correctly The mechanical strength of a pearl gloss synthetic paper and the homogeneity of quality are controllable by the molecular weight and its distribution situation of a raw material. The pearl gloss synthetic paper obtained by the manufacture method of this invention is presenting three layer structures. Since the paper imitation effect of a paper-like layer is heightened as shown in drawing 1 , polyethylene and inorganic powder can be blended and glossiness, note nature, and printing nature can be adjusted by the dosage. MFI of polyethylene adopts the thing of 0.1-7. The intensity of a paper-like side can be adjusted by MFI of polyethylene. The inorganic powder used by this invention can bring about the outstanding note nature and outstanding printing nature which are different from plastics paper in a paper-like layer besides lowering a foaming interlayer's density (micropore generating in an extension process being used). Inorganic powder chooses and uses one kind or varieties from groups, such as a calcium carbonate, diatomite, clay, a calcium oxide, a barium sulfate, and a titanium dioxide. The particle size is made into 0.1-10 microns, and the need of a product determines a dosage. this invention is manufactured by the twin screw extruder which feeds with the charge of combination from the side. The inorganic powder is put into an extruder from a side feeder. It can knead uniformly with the extruder using the twin screw. In addition, the composite grain which kneaded inorganic powder and the resin previously is put into the hopper of the method of the forefront, and after mixing with various resins, it can also put into an extruder further. In this invention, in order to adjust the opacity of a product, a whiteness degree, and anti-ultraviolet-rays nature, titanium-dioxide powder is used. The static-free agent of this invention can use all the static-free agents

currently used with usual biaxial-stretching polypropylene (BOPP). The third class amines are mainly used. Since the third class amine has charge translatability, it can remove static electricity generated in processing friction. In this invention, since it adheres mutually when rolling round a synthetic paper, it is necessary to add a antitack agent. One kind can be chosen from the silica currently used with usual biaxial-stretching polypropylene, clay, the poly methyl acrylic-acid methyl ester (PMMA), a glass bead, etc. The specific gravity of the polypropylene pearl gloss synthetic paper obtained by this invention is 0.75 or less, and can be adjusted by the composition ratio of mixture. This is low compared with 0.79 of the synthetic paper of the publication number No. 87255 [three to], and since it can manufacture the synthetic paper of a larger area in the same weight, economical efficiency is high. The biaxial-stretching polypropylene pearl gloss synthetic paper obtained by this invention has three layer structures of a paper-like layer / foaming interlayer / paper-like layer, or a resin layer, and physical properties and production capacity have a close relation to combination of material, a facility, and operation. The biaxial-stretching product of the usual polypropylene film is a transparent product with which most has not added the bulking agent. In this invention, in order to copy paper, it is necessary to add a lot of inorganic bulking agents in a manufacturing process, and a problem must be conquered about the productivity of a biaxial-stretching manufacturing process, production capacity, and quality stability. The equipment and the step of a manufacturing process which are used with the polypropylene pearl gloss synthetic paper (thickness of 25-250 microns) of this invention are shown in drawing 4 .

Extruder equipment ((1) of drawing 4): Consist of one twin screw main extruder with a side feeder, and two twin screw secondary extruders with a side feeder. Although the temperature setups change with composition of resin mixture, MFI, crystallinity, viscosity, the speed of a production line, and thickness of a product, they may usually be 180-280 degrees C. Below 180 degrees C, plasticization of a resin cannot progress and it cannot extrude by T die head. Above 280 degrees C, a resin will plasticize too much and a crack will enter. In this invention, a three-layer synthetic paper (a paper-like layer, a resin layer / foaming interlayer / paper-like layer, or resin layer) is manufactured by the three-layer co-extrusion method. The extrusion object of three layers is made to join by the **** design of T die head, and three layers are co-extruded by T die head.

Cooling forming-roll equipment ((2) of drawing 4): Consider as the cooling system of a water cooling type or a gas-cooling-method formula. The melting co-extrusion

object co-extruded three layers is cooled and fabricated at 180-280 degrees C. Control of cooling temperature influences greatly whether a subsequent step goes smoothly. Cooling temperature is usually set as 15-60 degrees C, and the thickness of a synthetic paper board and the speed of a production line can adjust it in this range.

Lengthwise extension equipment ((3) of drawing 4): Put the paper board which passed through cooling fabrication into lengthwise extension equipment. It heats first at 115-150 degrees C (it chooses at the rate of the thickness of a paper board, and a production line), a paper board is softened, it extends in a low speed and two high-speed stages further, and lengthwise intensity is given to a synthetic paper. Moreover, it fabricates with annealing. The lengthwise rate of extension is usually set up 3 to 6 times.

Longitudinal-direction extension equipment ((4) of drawing 4): 140-195 degrees C (it chooses at the rate of the thickness of a paper board and a production line) are made to heat and soften the paper board which became thin in lengthwise extension processing, extend in a longitudinal direction, fabricate with annealing further, and partial contraction of a pearl synthetic paper raises the stability of size. Usually, longitudinal direction draw magnification is set up 5 to 12 times. It can choose with the property of a product.

Corona-treatment equipment ((5) of drawing 4): In order that a corona treatment may improve the physical properties of a polypropylene pearl gloss synthetic paper, processing of a line crack, printing, an application, coating, etc. becomes easy. The high-frequency-discharge equipment (the speed of a production line adjusts) which sets processing efficiency to 20-120kW performs a corona treatment. Thereby, surface humid tension reaches [cm] in 36-48 dynes /.

Take-up motion ((6) of drawing 4): Use an iron pipe, roll round the completed pearl gloss synthetic paper, and consider as a finished product with a width of face of 8 meters. It cuts length or horizontally as occasion demands, it packs, and considers as the shape of a roll with a thickness of 25-250 microns, and a sheet-like product. The thickness of three layers in the thickness biaxial-stretching polypropylene pearl gloss synthetic paper of 25-250 microns obtained by the manufacture method of this invention is shown in Table 1. The thickness of a paper-like layer and a resin layer can be adjusted in 1-30 microns.

[0007] In order to explain the technical content of this invention clearly, the example of this invention which manufactured the synthetic paper of the object for a note, the object for printing, the object for packing, and various uses is shown below. However,

the patent range of this invention is not limited to this.

After mixing 67 % of the weight (MFI:2.4) of pedion paper-like side pearl gloss synthetic paper polypropylene with a [example 1] thickness of 250 microns or less, and 3 % of the weight of static electricity inhibitors, it puts into the twin screw main extruder which has a side feeder from a hopper, and puts into the twin screw main extruder which has a feeder, respectively further after measuring 20 % of the weight of calcium-carbonate powder, and 10 % of the weight of titanium dioxides. Moreover, after mixing 62 % of the weight (MFI:5) of polypropylene, 12 % of the weight (MFI:1) of polyethylene, 2 % of the weight of static electricity inhibitors, 3 % of the weight of antitack agents, and 1 % of the weight of ultraviolet ray absorbents by the mixer, it puts into the twin screw #1 secondary extruder which has a side feeder from a hopper. Furthermore, it puts into a twin screw #2 secondary extruder from two feeders, respectively after measuring 10 % of the weight of calcium-carbonate powder, and 10 % of the weight of titanium dioxides. Independently, after mixing 97 % of the weight (MFI:2.4) of polypropylene, and 3 % of the weight of antitack agents by the mixer, it puts into the twin screw #2 secondary extruder which has a side feeder from a hopper. The temperature of an extruder is set as 200-280 degrees C, and it extrudes from T die head with a three-layer co-extrusion method. It passes through the cooling roller set as 15-60 degrees C, and a polypropylene pearl gloss synthetic paper board is cooled and fabricated. After putting the fabricated paper board into lengthwise extension equipment and heating at 120-150 degrees C, extension is performed to lengthwise 5 times. After extension performs annealing. It puts into longitudinal direction extension equipment again after cooling, and heats at 150-185 degrees C, and extension is again performed in a longitudinal direction 9 times. After extension performs annealing and controls the contraction of a synthetic paper. After coming out of longitudinal direction extension equipment, it puts into corona-treatment equipment, and it improves and, finally the printing nature of a synthetic paper is rolled round with take-up motion. A pedion paper-like side pearl gloss synthetic paper with a thickness of 250 microns or less obtained by the above-mentioned method can be used widely for the use of a note, printing, packing, and others. The physical properties of a pedion paper-like side pearl gloss synthetic paper (the thickness of 60 microns chosen by this example, 100 microns, and 120 microns) are shown in Table 2.

After mixing 68 % of the weight (MFI:2.4) of double-sided paper-like side pearl gloss synthetic paper polypropylene with a [example 2] thickness of 250 microns or less, and 2 % of the weight of static electricity inhibitors, it puts into the twin screw main

extruder which has a side feeder from a hopper, and puts into a twin screw main extruder from two feeders further, respectively after measuring 15 % of the weight of calcium-carbonate powder, and 15 % of the weight of titanium dioxides. Moreover, after mixing 58 % of the weight (MFI:5) of polypropylene, 12 % of the weight (MFI:1) of polyethylene, 2 % of the weight of static electricity inhibitors, 3 % of the weight of antitack agents, and 1 % of the weight of ultraviolet ray absorbents by the mixer, it puts into two twin screw secondary extruders which have the side feeder of #1 and #2 from a hopper, respectively. Furthermore, it puts into #1 and a #2 twin screw secondary extruder from two side feeders, respectively after measuring 12 % of the weight of calcium-carbonate powder, and 12 % of the weight of titanium dioxides. The temperature of an extruder is set as 200-280 degrees C, and it extrudes from T die head with a three-layer co-extrusion method. It passes through the cooling roller set as 25-60 degrees C, and a polypropylene pearl gloss synthetic paper board is cooled and fabricated. After putting the fabricated paper board into lengthwise extension equipment and heating at 120-150 degrees C, extension is performed to lengthwise 4.5 times. After extension performs annealing. It puts into longitudinal direction extension equipment again after cooling, and heats at 155-190 degrees C, and extension is again performed in a longitudinal direction 8.5 times. After extension performs annealing and controls the contraction of a synthetic paper. After coming out of longitudinal direction extension equipment, it puts into corona-treatment equipment, and it improves and, finally the printing nature of a synthetic paper is rolled round with take-up motion. A double-sided paper-like side pearl gloss synthetic paper with a thickness of 250 microns or less obtained by the above-mentioned method can be used widely for the use of a note, printing, packing, and others. The physical properties of a double-sided paper-like side pearl gloss synthetic paper (the thickness of 60 microns chosen by this example, 100 microns, and 150 microns) are shown in Table 3.

After mixing 62 % of the weight (MFI:2.4) of double-sided glossy-surface pearl gloss synthetic paper polypropylene with a [example 3] thickness of 250 microns or less, and 3 % of the weight of static electricity inhibitors, it puts into the twin screw main extruder which has a side feeder from a hopper, and puts into a twin screw main extruder from two feeders further, respectively after measuring 20 % of the weight of calcium-carbonate powder, and 15 % of the weight of titanium dioxides. Moreover, after mixing 96 % of the weight (MFI:3.0) of polypropylene, 2 % of the weight of static electricity inhibitors, and 2 % of the weight of antitack agents by the mixer, it puts into the twin screw secondary extruder which has the side feeder of #1 and #2,

respectively. The temperature of an extruder is set as 200-280 degrees C, and it extrudes from T die head with a three-layer co-extrusion method. It passes through the cooling roller set as 15-60 degrees C, and a polypropylene pearl gloss synthetic paper board is cooled and fabricated. After putting the fabricated paper board into lengthwise extension equipment and heating at 120-150 degrees C, extension is performed to lengthwise 5 times. After extension performs annealing. It puts into longitudinal direction extension equipment again after cooling, and heats at 150-185 degrees C, and extension is again performed in a longitudinal direction 9 times. After extension performs annealing and controls the contraction of a synthetic paper. After coming out of longitudinal direction extension equipment, it puts into corona-treatment equipment, and it improves and, finally the printing nature of a synthetic paper is rolled round with take-up motion. A double-sided glossy-surface pearl gloss synthetic paper with a thickness of 250 microns or less obtained by the above-mentioned method can be used widely for the use of a note, printing, packing, and others. The physical properties of a double-sided glossy-surface pearl gloss synthetic paper (the thickness of 70 microns chosen by this example, 110 microns, and 140 microns) are shown in Table 4.

[0008]

[Effect of the Invention] Although the synthetic paper obtained by the manufacture method of this invention extended the paper-like layer to lengthwise, it has a big difference about combination of a manufacturing process and a use raw material with the conventional product which uses as a uniaxial-stretching layer the film which has not carried out longitudinal direction extension. Thereby, a use can be extended instead of natural paper and it has the following advantages. The raw material of a paper-like layer makes a principal component polypropylene, polyethylene, a titanium dioxide, and inorganic powder, and has mud lime gloss, and a whiteness degree and the degree of cover exceed the conventional paper. The paper-like layer of biaxial stretching has the outstanding rigidity, the fixing nature of inorganic powder is also good and powder is not omitted in printing process. Since it has the same rate of extension and contraction of paper becomes uniform, a paper-like layer and a resin layer, and a foaming interlayer cannot transform the heated field easily in the shape of a wave. Moreover, the paper-like layer and the foaming interlayer with the same rate of extension cannot exfoliate easily. The thickness of a paper-like layer and a resin layer is controllable in 1-30 microns with the extrusion outlet from a subextruder (the thickness of a product can be changed by need and the use). The production rate of a manufacturing process is quick and reaches in a maximum of

3.5t /in an hour. The maximum width is 8 meters and 25-250 microns and the selection range are [thickness] latus. A paper-like layer, a resin layer, and a foaming interlayer are extruded from the twin screw extruder which has a feeder in the side, and kneading of a raw material can control the thickness of eye a uniform hatchet and a product within **2%. Since an extruder can put inorganic powdered powder into the feeder of the side, it does not need to use only the composite grain (masterbatch) of inorganic powder, and can cut down raw material cost sharply. In addition, the composite grain of inorganic powder is also producible with a single screw-thread rod-extrusion machine. However, it is necessary to raise the rate of ratio of length to diameter of the screw-thread rod of an extruder (length/diameter), and to make kneading of a raw material uniform. A production cost is low and has commercial-scene competitive strength.

[Translation done.]

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TECHNICAL FIELD

[The technical field to which invention belongs] this invention relates to the manufacture method of the thickness biaxial-stretching polypropylene pearl gloss synthetic paper of 25-250 microns obtained by the three-layer co-extrusion method. The mixed extrusion object of polypropylene resin and an inorganic substance extruded from two twin screw secondary extruders which have especially one twin screw main extruder which has a feeder, respectively, and a feeder by the three-layer co-extrusion method is made to join. It considers as the three-layer sheet of a paper-like layer, a resin layer / foaming interlayer / paper-like layer, or a resin layer through one T die head. Furthermore pass steps, such as cooling fabrication, biaxial stretching, a corona treatment, and winding. The three-layer co-extrusion double-sided paper-like side pearl gloss synthetic paper of a paper-like layer / foaming interlayer / paper-like layer with the thickness of 25-250 microns, The three-layer co-extrusion pedion paper-like side pearl gloss synthetic paper of a paper-like layer / foaming interlayer / resin layer and the three-layer co-extrusion double-sided glossy-surface pearl gloss synthetic paper of a resin layer / foaming interlayer / resin layer are manufactured, and what is used as the application paper of the synthetic paper for an application is pointed out.
[0002]

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PRIOR ART

[Description of the Prior Art] The present polyolefine synthetic paper tends to replace natural pulp paper-milling paper. The synthetic paper which uses the biaxially oriented film of polypropylene as a base-material layer (interlayer), and uses as a paper-like layer the polypropylene 1 shaft oriented film which includes the non-subtlety fine powder end of 8 - 65 % of the weight in both sides is applied for and put in practical use. Oji-Yuka Synthetic Paper, Inc. has submitted patent application, such as JP,46-40794,B, JP,56-141339,A, JP,56-118437,A, and JP,3-87255,A.

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TECHNICAL PROBLEM

[Problem(s) to be Solved by the Invention] From these manufacture methods, the base-material layer was placed between lengthwise extension equipment and longitudinal direction extension equipment, two sets of extruders were used, the vertical film was made, and the paper-like layer is completed by them. A paper-like layer can be extended only in a longitudinal direction, and the intensity of a paper-like layer is low. Since it drops out in a printing processing process the end of non-subtlety fine powder it is added in order to raise the printing nature of a paper-like layer, it is necessary to clean a printing machine machine. Moreover, the total rates of extension differ, for this reason, at the time of heating, the contractions of a paper-like layer and a base-material layer will also differ, and paper will deform the paper-like layer obtained by uniaxial stretching, and the base-material layer obtained by biaxial stretching in the shape of a wave. In order to raise the stability of a manufacturing process and product quality furthermore, in the manufacturing process of the paper-like layer which completes a vertical film by two sets of extruders, a production rate is restricted and the width of face of the finished product after extension is only a maximum of 6 meters. As for the thickness of eye an at least 10-micron (usually 30 microns) required hatchet and a product, the thickness of a single paper-like layer always becomes 60 microns or more. Otherwise, the thickness of a product will become uneven and printing processing will be affected. The degree of difficulty of a manufacturing process is high on the whole, since a production cost is also high, a product cannot spread easily and application is difficult.

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MEANS

[Means for Solving the Problem] In order to solve the above-mentioned problem, this invention applicant submits the manufacture method of a new 3 layer-structure synthetic paper. The synthetic paper concerned consists of a paper-like layer, a resin layer / foaming interlayer / paper-like layer, or a resin layer. From a twin screw main extruder with one set of a feeder, a foaming interlayer's polypropylene resin mixture The resin mixture of a paper-like layer or a resin layer is extruded from a twin screw secondary extruder with two sets of feeders, respectively. These extrusion objects are made to join, it considers as a three-layer sheet through one T die head, and the pearl gloss synthetic paper of three-layer ******** / double-sided paper-like side with the thickness of 25-250 microns, and a double-sided glossy surface is further obtained through steps, such as cooling fabrication, biaxial stretching, a corona treatment, and winding. The manufacture method of this invention adopts a three-layer co-extrusion method. After making the extrusion object of each class join, with the synthetic paper which stuck the paper-like side which carried out uniaxial stretching to the interlayer who did biaxial stretching by the co-extrusion and the method of the former [synthetic paper / which was obtained by carrying out a 2 axial-stress total] further, and was obtained, it differs also from structure and the manufacture method. By choosing out of the paper-like layer which used the inorganic bulking agent for the raw material simultaneously extruded from a subextruder, and the resin layer which has not added the inorganic bulking agent, the three-layer co-extrusion double-sided paper-like side pearl gloss synthetic paper of a paper-like layer / foaming interlayer / paper-like layer, the three-layer co-extrusion pedion paper-like side pearl gloss synthetic paper of a paper-like layer / foaming interlayer / resin layer, and the three-layer co-extrusion double-sided glossy-surface pearl gloss synthetic paper of a resin layer / foaming interlayer / resin

layer can be manufactured, and it can consider as the.

[0006]

[Embodiments of the Invention] In order to show the technical content of this invention clearly, polypropylene resin mixture and a manufacturing process (extruding three-layer co-extrusion, cooling, biaxial stretching, a corona treatment, winding) are explained below. The biaxial-stretching polypropylene pearl gloss synthetic paper of this invention has three layer structures. The foaming interlayer extrudes with a twin screw main extruder with one set of a side feeder. 39 - 95 % of the weight of high crystallinity polypropylene of 97% or more of isotactic degree and 1 - 5 % of the weight of static electricity inhibitors are uniformly stirred with the hopper which is ahead of the main extruder, and it puts into the main extruder. Furthermore, it puts into the main extruder by one set or two sets of side feeders after measuring 0 - 40 % of the weight of calcium-carbonate powder, and 0 - 20 % of the weight of titanium-dioxide powder. After kneading uniformly with the twin screw of the main extruder, the mixture of a resin and inorganic powder is pushed on middle RANA (runner) of T die head. Moreover, a paper-like layer is extruded with two twin screw main extruders with a side feeder. After stirring uniformly 20 - 99.5 % of the weight of polypropylene, 0 - 12 % of the weight of polyethylene, 0 - 3 % of the weight of static electricity inhibitors, 0.5 - 3 % of the weight of antitack agents, and 0 - 2 % of the weight of ultraviolet ray absorbents with the hopper which is ahead [subextruder], it puts into a subextruder. Furthermore, it puts into a subextruder by one set or two sets of side feeders after measuring 0 - 40 % of the weight of calcium-carbonate powder, and 0 - 20 % of the weight of titanium-dioxide powder. After kneading uniformly with the twin screw of a subextruder, the mixture of a resin and inorganic powder is pushed on the both-sides path of T die head. The extrusion object from three above-mentioned extruders is made to join, and the sheet of a co-extrusion, a resin layer, a paper-like layer / foaming interlayer / resin layer, or a paper-like layer is formed by T die head. The pearl gloss synthetic paper of ** / pedion paper-like side with a thickness of 20-250 microns is manufactured through biaxial stretching, a corona treatment, and the step of winding. The synthetic paper manufactured by the manufacture method of this invention fits cultural paper, and is using high crystallinity polypropylene as main raw materials. Melting indices (MFI) are 0.5-8 (230 degrees C / 2.16kg ASTM D1238), and use as a homogeneous-polymerization object with isotactic most the polypropylene resin used by this invention. this kind of macromolecule structure -- molecules -- an array -- it has joined together correctly The mechanical strength of a pearl gloss synthetic paper and

the homogeneity of quality are controllable by the molecular weight and its distribution situation of a raw material. The pearl gloss synthetic paper obtained by the manufacture method of this invention is presenting three layer structures. Since the paper imitation effect of a paper-like layer is heightened as shown in drawing 1 , polyethylene and inorganic powder can be blended and glossiness, note nature, and printing nature can be adjusted by the dosage. MFI of polyethylene adopts the thing of 0.1-7. The intensity of a paper-like side can be adjusted by MFI of polyethylene. The inorganic powder used by this invention can bring about the outstanding note nature and outstanding printing nature which are different from plastics paper in a paper-like layer besides lowering a foaming interlayer's density (micropore generating in an extension process being used). Inorganic powder chooses and uses one kind or varieties from groups, such as a calcium carbonate, diatomite, clay, a calcium oxide, a barium sulfate, and a titanium dioxide. The particle size is made into 0.1-10 microns, and the need of a product determines a dosage. this invention is manufactured by the twin screw extruder which feeds with the charge of combination from the side. The inorganic powder is put into an extruder from a side feeder. It can knead uniformly with the extruder using the twin screw. In addition, the composite grain which kneaded inorganic powder and the resin previously is put into the hopper of the method of the forefront, and after mixing with various resins, it can also put into an extruder further. In this invention, in order to adjust the opacity of a product, a whiteness degree, and anti-ultraviolet-rays nature, titanium-dioxide powder is used. The static-free agent of this invention can use all the static-free agents currently used with usual biaxial-stretching polypropylene (BOPP). The third class amines are mainly used. Since the third class amine has charge translatability, it can remove static electricity generated in processing friction. In this invention, since it adheres mutually when rolling round a synthetic paper, it is necessary to add a antitack agent. One kind can be chosen from the silica currently used with usual biaxial-stretching polypropylene, clay, the poly methyl acrylic-acid methyl ester (PMMA), a glass bead, etc. The specific gravity of the polypropylene pearl gloss synthetic paper obtained by this invention is 0.75 or less, and can be adjusted by the composition ratio of mixture. This is low compared with 0.79 of the synthetic paper of the publication number No. 87255 [three to], and since it can manufacture the synthetic paper of latus area more in the same weight, economical efficiency is high. The biaxial-stretching polypropylene pearl gloss synthetic paper obtained by this invention has three layer structures of a paper-like layer / foaming interlayer / paper-like layer, or a resin layer, and physical properties and production capacity have a

close relation to combination of material, a facility, and operation. The biaxial-stretching product of the usual polypropylene film is a transparent product with which most has not added the bulking agent. In this invention, in order to copy paper, it is necessary to add a lot of inorganic bulking agents in a manufacturing process, and a problem must be conquered about the productivity of a biaxial-stretching manufacturing process, production capacity, and quality stability. The equipment and the step of a manufacturing process which are used with the polypropylene pearl gloss synthetic paper (thickness of 25-250 microns) of this invention are shown in drawing 4 .

Extruder equipment ((1) of drawing 4): Consist of one twin screw main extruder with a side feeder, and two twin screw secondary extruders with a side feeder. Although the temperature setups change with composition of resin mixture, MFI, crystallinity, viscosity, the speed of a production line, and thickness of a product, they may usually be 180-280 degrees C. Below 180 degrees C, plasticization of a resin cannot progress and it cannot extrude by T die head. Above 280 degrees C, a resin will plasticize too much and a crack will enter. In this invention, a three-layer synthetic paper (a paper-like layer, a resin layer / foaming interlayer / paper-like layer, or resin layer) is manufactured by the three-layer co-extrusion method. The extrusion object of three layers is made to join by the **** design of T die head, and three layers are co-extruded by T die head.

Cooling forming-roll equipment ((2) of drawing 4): Consider as the cooling system of a water cooling type or a gas-cooling-method formula. The melting co-extrusion object co-extruded three layers is cooled and fabricated at 180-280 degrees C. Control of cooling temperature influences greatly whether a subsequent step goes smoothly. Cooling temperature is usually set as 15-60 degrees C, and the thickness of a synthetic paper board and the speed of a production line can adjust it in this range.

Lengthwise extension equipment ((3) of drawing 4): Put the paper board which passed through cooling fabrication into lengthwise extension equipment. It heats first at 115-150 degrees C (it chooses at the rate of the thickness of a paper board, and a production line), a paper board is softened, it extends in a low speed and two high-speed stages further, and lengthwise intensity is given to a synthetic paper. Moreover, it fabricates with annealing. The lengthwise rate of extension is usually set up 3 to 6 times.

Longitudinal-direction extension equipment ((4) of drawing 4): 140-195 degrees C (it chooses at the rate of the thickness of a paper board and a production line) are

made to heat and soften the paper board which became thin in lengthwise extension processing, extend in a longitudinal direction, fabricate with annealing further, and partial contraction of a pearl synthetic paper raises the stability of size. Usually, longitudinal direction draw magnification is set up 5 to 12 times. It can choose with the property of a product.

Corona-treatment equipment ((5) of drawing 4): In order that a corona treatment may improve the physical properties of a polypropylene pearl gloss synthetic paper, processing of a line crack, printing, an application, coating, etc. becomes easy. The high-frequency-discharge equipment (the speed of a production line adjusts) which sets processing efficiency to 20-120kW performs a corona treatment. Thereby, surface humid tension reaches [cm] in 36-48 dynes /.

Take-up motion ((6) of drawing 4): Use an iron pipe, roll round the completed pearl gloss synthetic paper, and consider as a finished product with a width of face of 8 meters. It cuts length or horizontally as occasion demands, it packs, and considers as the shape of a roll with a thickness of 25-250 microns, and a sheet-like product. The thickness of three layers in the thickness biaxial-stretching polypropylene pearl gloss synthetic paper of 25-250 microns obtained by the manufacture method of this invention is shown in Table 1. The thickness of a paper-like layer and a resin layer can be adjusted in 1-30 microns.

[0007] In order to explain the technical contents of this invention clearly, the example of this invention which manufactured the synthetic paper of the object for a note, the object for printing, the object for packing, and various uses is shown below. However, the patent range of this invention is not limited to this.

After mixing 67 % of the weight (MFI:2.4) of pedion paper-like side pearl gloss synthetic paper polypropylene with a [example 1] thickness of 250 microns or less, and 3 % of the weight of static electricity inhibitors, it puts into the twin screw main extruder which has a side feeder from a hopper, and puts into the twin screw main extruder which has a feeder, respectively further after measuring 20 % of the weight of calcium-carbonate powder, and 10 % of the weight of titanium dioxides. Moreover, after mixing 62 % of the weight (MFI:5) of polypropylene, 12 % of the weight (MFI:1) of polyethylene, 2 % of the weight of static electricity inhibitors, 3 % of the weight of antitack agents, and 1 % of the weight of ultraviolet ray absorbents by the mixer, it puts into the twin screw #1 secondary extruder which has a side feeder from a hopper. Furthermore, it puts into a twin screw #2 secondary extruder from two feeders, respectively after measuring 10 % of the weight of calcium-carbonate powder, and 10 % of the weight of titanium dioxides. Independently, after mixing 97

% of the weight (MFI:2.4) of polypropylene, and 3 % of the weight of antitack agents by the mixer, it puts into the twin screw #2 secondary extruder which has a side feeder from a hopper. The temperature of an extruder is set as 200-280 degrees C, and it extrudes from T die head with a three-layer co-extrusion method. It passes through the cooling roller set as 15-60 degrees C, and a polypropylene pearl gloss synthetic paper board is cooled and fabricated. After putting the fabricated paper board into lengthwise extension equipment and heating at 120-150 degrees C, extension is performed to lengthwise 5 times. After extension performs annealing. It puts into longitudinal direction extension equipment again after cooling, and heats at 150-185 degrees C, and extension is again performed in a longitudinal direction 9 times. After extension performs annealing and controls the contraction of a synthetic paper. After coming out of longitudinal direction extension equipment, it puts into corona-treatment equipment, and it improves and, finally the printing nature of a synthetic paper is rolled round with take-up motion. A pedion paper-like side pearl gloss synthetic paper with a thickness of 250 microns or less obtained by the above-mentioned method can be used widely for the use of a note, printing, packing, and others. The physical properties of a pedion paper-like side pearl gloss synthetic paper (the thickness of 60 microns chosen by this example, 100 microns, and 120 microns) are shown in Table 2.

After mixing 68 % of the weight (MFI:2.4) of double-sided paper-like side pearl gloss synthetic paper polypropylene with a [example 2] thickness of 250 microns or less, and 2 % of the weight of static electricity inhibitors, it puts into the twin screw main extruder which has a side feeder from a hopper, and puts into a twin screw main extruder from two feeders further, respectively after measuring 15 % of the weight of calcium-carbonate powder, and 15 % of the weight of titanium dioxides. Moreover, after mixing 58 % of the weight (MFI:5) of polypropylene, 12 % of the weight (MFI:1) of polyethylene, 2 % of the weight of static electricity inhibitors, 3 % of the weight of antitack agents, and 1 % of the weight of ultraviolet ray absorbents by the mixer, it puts into two twin screw secondary extruders which have the side feeder of #1 and #2 from a hopper, respectively. Furthermore, it puts into #1 and a #2 twin screw secondary extruder from two side feeders, respectively after measuring 12 % of the weight of calcium-carbonate powder, and 12 % of the weight of titanium dioxides. The temperature of an extruder is set as 200-280 degrees C, and it extrudes from T die head with a three-layer co-extrusion method. It passes through the cooling roller set as 25-60 degrees C, and a polypropylene pearl gloss synthetic paper board is cooled and fabricated. After putting the fabricated paper board into lengthwise

extension equipment and heating at 120-150 degrees C, extension is performed to lengthwise 4.5 times. After extension performs annealing. It puts into longitudinal direction extension equipment again after cooling, and heats at 155-190 degrees C, and extension is again performed in a longitudinal direction 8.5 times. After extension performs annealing and controls the contraction of a synthetic paper. After coming out of longitudinal direction extension equipment, it puts into corona-treatment equipment, and it improves and, finally the printing nature of a synthetic paper is rolled round with take-up motion. A double-sided paper-like side pearl gloss synthetic paper with a thickness of 250 microns or less obtained by the above-mentioned method can be used widely for the use of a note, printing, packing, and others. The physical properties of a double-sided paper-like side pearl gloss synthetic paper (the thickness of 60 microns chosen by this example, 100 microns, and 150 microns) are shown in Table 3.

After mixing 62 % of the weight (MFI:2.4) of double-sided glossy-surface pearl gloss synthetic paper polypropylene with a [example 3] thickness of 250 microns or less, and 3 % of the weight of static electricity inhibitors, it puts into the twin screw main extruder which has a side feeder from a hopper, and puts into a twin screw main extruder from two feeders further, respectively after measuring 20 % of the weight of calcium-carbonate powder, and 15 % of the weight of titanium dioxides. Moreover, after mixing 96 % of the weight (MFI:3.0) of polypropylene, 2 % of the weight of static electricity inhibitors, and 2 % of the weight of antitack agents by the mixer, it puts into the twin screw secondary extruder which has the side feeder of #1 and #2, respectively. The temperature of an extruder is set as 200-280 degrees C, and it extrudes from T die head with a three-layer co-extrusion method. It passes through the cooling roller set as 15-60 degrees C, and a polypropylene pearl gloss synthetic paper board is cooled and fabricated. After putting the fabricated paper board into lengthwise extension equipment and heating at 120-150 degrees C, extension is performed to lengthwise 5 times. After extension performs annealing. It puts into longitudinal direction extension equipment again after cooling, and heats at 150-185 degrees C, and extension is again performed in a longitudinal direction 9 times. After extension performs annealing and controls the contraction of a synthetic paper. After coming out of longitudinal direction extension equipment, it puts into corona-treatment equipment, and it improves and, finally the printing nature of a synthetic paper is rolled round with take-up motion. A double-sided glossy-surface pearl gloss synthetic paper with a thickness of 250 microns or less obtained by the above-mentioned method can be used widely for the use of a note, printing, packing, and

others. The physical properties of a double-sided glossy-surface pearl gloss synthetic paper (the thickness of 70 microns chosen by this example, 110 microns, and 140 microns) are shown in Table 4.

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DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1] Three layer structures of the thickness biaxial-stretching polypropylene pearl gloss synthetic paper of 25-250 microns obtained by the three-layer co-extrusion method (a paper-like layer / foaming interlayer / paper-like layer)
[Drawing 2] Three layer structures of the thickness biaxial-stretching polypropylene pearl gloss synthetic paper of 25-250 microns obtained by the three-layer co-extrusion method (a paper-like layer / foaming interlayer / resin layer)
[Drawing 3] Three layer structures of the thickness biaxial-stretching polypropylene pearl gloss synthetic paper of 25-250 microns obtained by the three-layer co-extrusion method (a resin layer / foaming interlayer / resin layer)
[Drawing 4] Manufacturing installation explanatory drawing of this invention
Extruder equipment
Cooling forming-roll equipment
Lengthwise extension equipment
Longitudinal direction extension equipment
Corona-treatment equipment
Take-up motion
[Table 1]

合成紙の厚み	25μ	50μ	100μ	150μ	200μ	250μ
紙状層／樹脂層	1~3μ	1~10μ	1~20μ	2~30μ	5~30μ	10~30μ
中間層	23~19μ	48~30μ	98~60μ	146~90μ	190~140μ	230~190μ
紙状層／樹脂層	1~3μ	1~10μ	1~20μ	2~30μ	5~30μ	10~30μ

[Table 2]

項目	合成紙の厚み			測定方法
	60μ	100μ	120μ	
比重 (−)	0.70	0.70	0.70	ASTM D-1248
単位重量(g/m²)	42.0	70.0	84.0	JIS P-8124
光沢度 (%)	25/110	26/110	25/111	TAPPI T-480
白色度 (%)	97	97	97	TAPPI T-525
不透明度(%)	85	92	94	TAPPI T-425
粗さ (μ)	0.70	0.70	0.70	TAPPI T-555
表面抵抗 (Ω)	10^{13}	10^{13}	10^{13}	EN 45014

[Table 3]

項目	合成紙の厚み			測定方法
	60μ	100μ	150μ	
比重 (−)	0.70	0.70	0.70	ASTM D-1248
単位重量(g/m²)	42.0	57.0	81.0	JIS P-8124
光沢度 (%)	26/25	26/26	27/26	TAPPI T-480
白色度 (%)	97	97	97	TAPPI T-525
不透明度(%)	89	94	96	TAPPI T-425
粗さ (μ)	0.70	0.70	0.70	TAPPI T-555
表面抵抗 (Ω)	10^{13}	10^{13}	10^{13}	EN 45014

[Table 4]

項目	合成紙の厚み			測定方法
	70μ	110μ	140μ	
比重 (−)	0.70	0.70	0.65	ASTM D-1248
単位重量(g/m²)	49.0	77.0	91.0	JIS P-8124
光沢度 (%)	110/111	112/110	109/110	TAPPI T-480
白色度 (%)	85	87	89	TAPPI T-525
不透明度(%)	85	92	94	TAPPI T-425
粗さ (μ)	0.5	0.5	0.5	TAPPI T-555
表面抵抗 (Ω)	10^{13}	10^{13}	10^{13}	EN 45014

[Translation done.]

L Number	Hits	Search Text	DB	Time stamp
1	9	(("6238785") or ("6599453") or ("6332940") or ("6368543") or ("5552011") or ("6364988") or ("6379605") or ("20030099823") or ("20030077432")).PN.	USPAT; US-PGPUB	2003/09/26 14:51
3	256438	foam or foamed or foaming or foamable or expandable	USPAT; US-PGPUB	2003/09/26 15:20
4	4	((("6238785") or ("6599453") or ("6332940") or ("6368543") or ("5552011") or ("6364988") or ("6379605") or ("20030099823") or ("20030077432")).PN.) and (foam or foamed or foaming or foamable or expandable)	USPAT; US-PGPUB	2003/09/26 14:55
5	9519	(synthetic or pearly) near2 paper	USPAT; US-PGPUB	2003/09/26 15:05
6	5306	5.ti,ab,bsum,clm.	USPAT; US-PGPUB	2003/09/26 14:58
7	15759	blowing adj1 (agent or material or substance or resin or composition)	USPAT; US-PGPUB	2003/09/26 15:21
8	93953	(bopp or polypropylene).ti,ab,bsum,clm.	USPAT; US-PGPUB	2003/09/26 15:02
9	2290	5.ti,ab,bsum,clm. and ((bopp or polypropylene).ti,ab,bsum,clm.)	USPAT; US-PGPUB	2003/09/26 15:00
10	565	((foam or foamed or foaming or foamable or expandable) or (blowing adj1 (agent or material or substance or resin or composition))) and (5.ti,ab,bsum,clm. and ((bopp or polypropylene).ti,ab,bsum,clm.))	USPAT; US-PGPUB	2003/09/26 15:01
11	2209	(bopp or ((stretch or stretched or stratching or orienting or oriented or orientation) near2 polypropylene)).ti,ab,bsum,clm.	USPAT; US-PGPUB	2003/09/26 15:09
12	9550	(synthetic or pearly or man-made) near2 paper	USPAT; US-PGPUB	2003/09/26 15:19
13	5330	12.ti,ab,bsum,clm.	USPAT; US-PGPUB	2003/09/26 15:08
14	2260	(bopp or ((stretch or stretched or stretching or orienting or oriented or orientation) near2 polypropylene)).ti,ab,bsum,clm.	USPAT; US-PGPUB	2003/09/26 15:20
15	26	12.ti,ab,bsum,clm. and ((bopp or ((stretch or stretched or stretching or orienting or oriented or orientation) near2 polypropylene)).ti,ab,bsum,clm.) and ((foam or foamed or foaming or foamable or expandable) or (blowing adj1 (agent or material or substance or resin or composition)))	USPAT; US-PGPUB	2003/09/26 15:10
16	2	("5552011" | "6332940").PN.	USPAT	2003/09/26 15:13
17	6	("3773608" | "4121006" | "4652409" | "5484560" | "5552011" | "5637366").PN.	USPAT	2003/09/26 15:16
19	7329	(synthetic or pearly or man-made or polymeric) near2 paper	EPO; JPO; DERWENT	2003/09/26 15:20
20	3132	(bopp or ((stretch or stretched or stretching or orienting or oriented or orientation) near2 polypropylene))	EPO; JPO; DERWENT	2003/09/26 15:20
21	266819	foam or foamed or foaming or foamable or expandable	EPO; JPO; DERWENT	2003/09/26 15:20
22	14342	blowing adj1 (agent or material or substance or resin or composition)	EPO; JPO; DERWENT	2003/09/26 15:21
24	10	((synthetic or pearly or man-made or polymeric) near2 paper) and ((bopp or ((stretch or stretched or stretching or orienting or oriented or orientation) near2 polypropylene))) and ((foam or foamed or foaming or foamable or expandable) or (blowing adj1 (agent or material or substance or resin or composition)))	EPO; JPO; DERWENT	2003/09/26 15:23